

# Hemorrhage Control

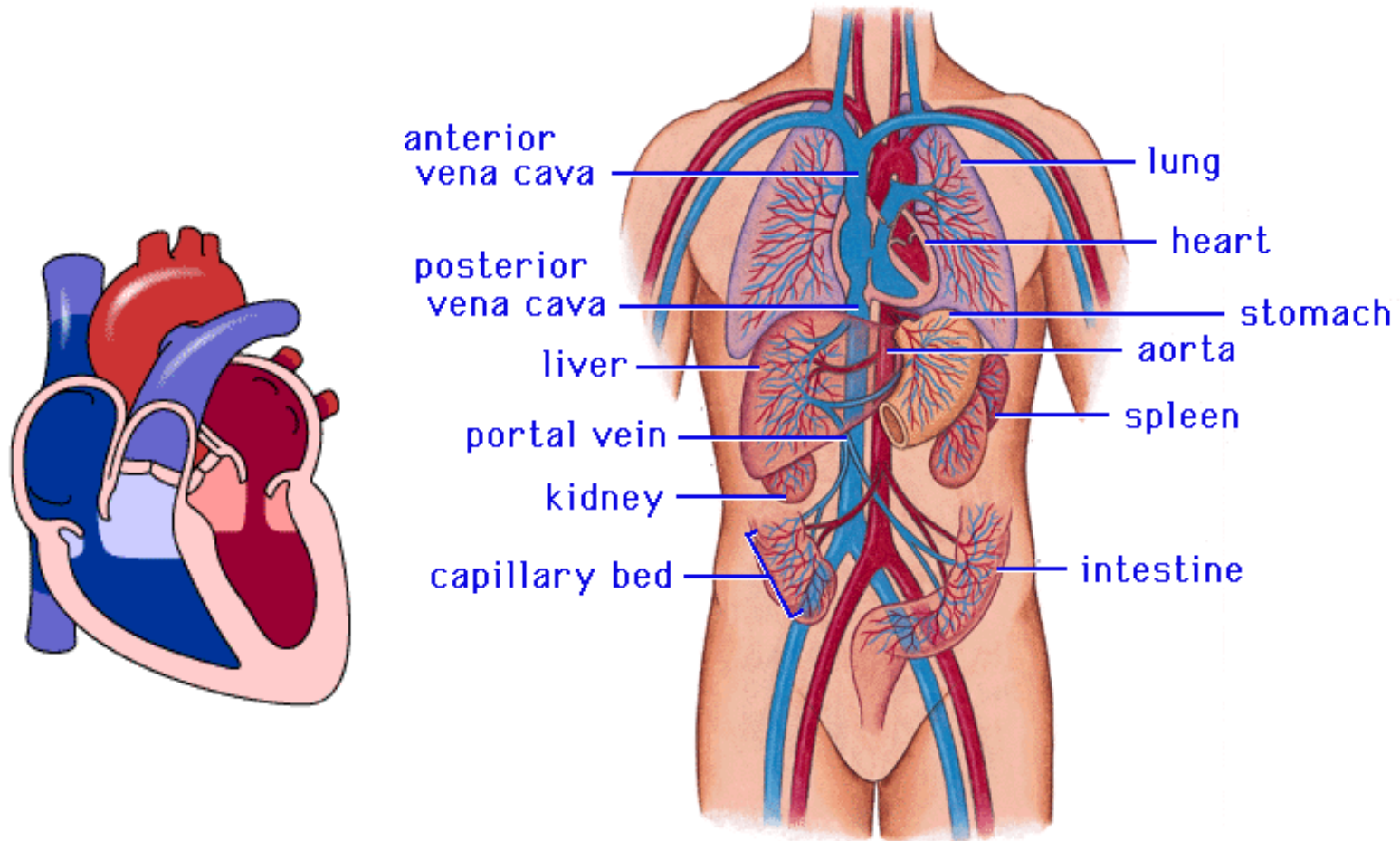


COMBAT MEDIC ADVANCED SKILLS TRAINING (CMAST)

# Introduction

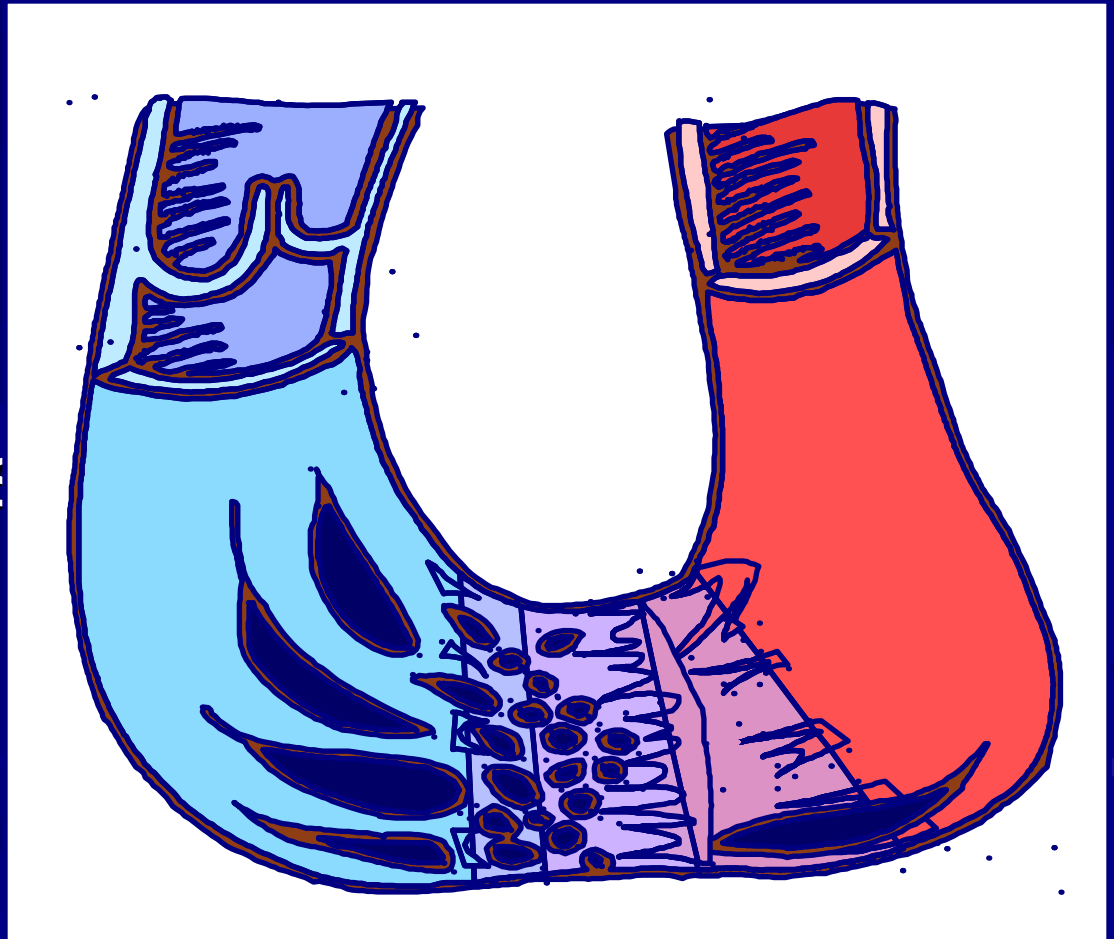
- Review methods of hemorrhage control in a tactical environment.
- Hemorrhage is the leading cause of preventable death on the battlefield.
- Hemorrhage control save lives.
- New Hemostatic agents available.

# Cardiovascular System



# Blood Vessels

- Arteries
- Arterioles
- Capillaries
- Venules
- Veins





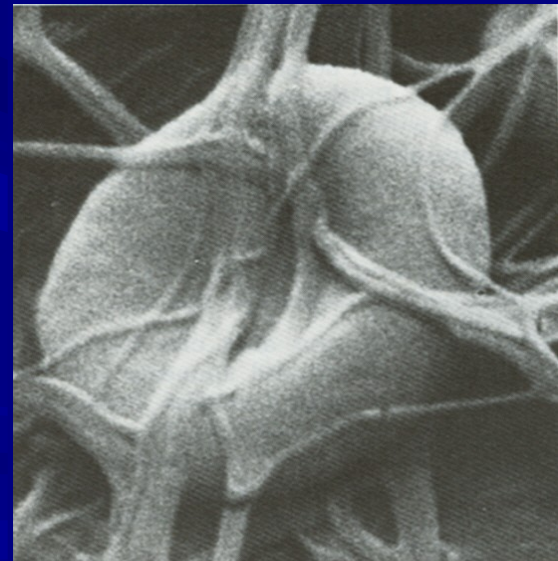
# Pulses

- Left ventricle contracts.
- Peripheral pulses:
  - Radial
  - Brachial
  - Posterior tibial
  - Dorsalis pedis
- Central pulses:
  - Carotid
  - Femoral



# Blood

- Adult body:
  - Contains approximately 5 to 6 liters of blood
  - Loss of 1 pint of blood without harmful effects
  - Loss of 2 pints may cause shock
- Three phases of hemostasis:
  - Vascular spasm
  - Platelet plug formation
  - Blood clotting (coagulation cascade)



# Hemorrhage

- Pulse vs. Blood Pressure.
- How long until there are changes?
- Young healthy adults compensate for long periods, then decompensate rapidly.
- At what blood pressure do casualties lose consciousness?
  - @ 50 mm Hg

# Clinical Signs of Acute Hemorrhage

Class	% Blood Loss	Clinical Signs
I	Up to 750 ml (15%)	Slight increase in HR; no change in BP or respirations
II	750-1500 ml (15-30%)	Increased HR and respirations; increased diastolic BP; anxiety, fright or hostility
III	1500-2000 ml (30-40%)	Increased HR and respirations; fall in systolic BP; significant AMS
IV	>2000 (>40%)	Severe tachycardia; severe lowering of BP; cold, pale skin; severe AMS



# Sources of Hemorrhage

- External:
  - Visible blood is hard to estimate
- Internal:
  - May be hidden within the torso or even in the extremities secondary to fractures

# Sources of External Bleeding

- Arterial:
  - Rapid, profuse and pulsating
  - Bright red in color
- Venous:
  - Steady flow
  - Dark red or maroon in color
- Capillary:
  - Slow and oozing
  - Often clots spontaneously



# Extremity Hemorrhage



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# Internal Signs of Hemorrhage

- Soft tissue bruising.
- Abdominal tenderness.
- Hemoptysis.
- Hematemesis.
- Melena.





# Injured Internal Organs



# Hemorrhage Control

- Assess the tactical situation.
- Expose the wound.
- Attempt to control the bleeding with direct pressure or a pressure dressing.



# THE EMERGENCY BANDAGE

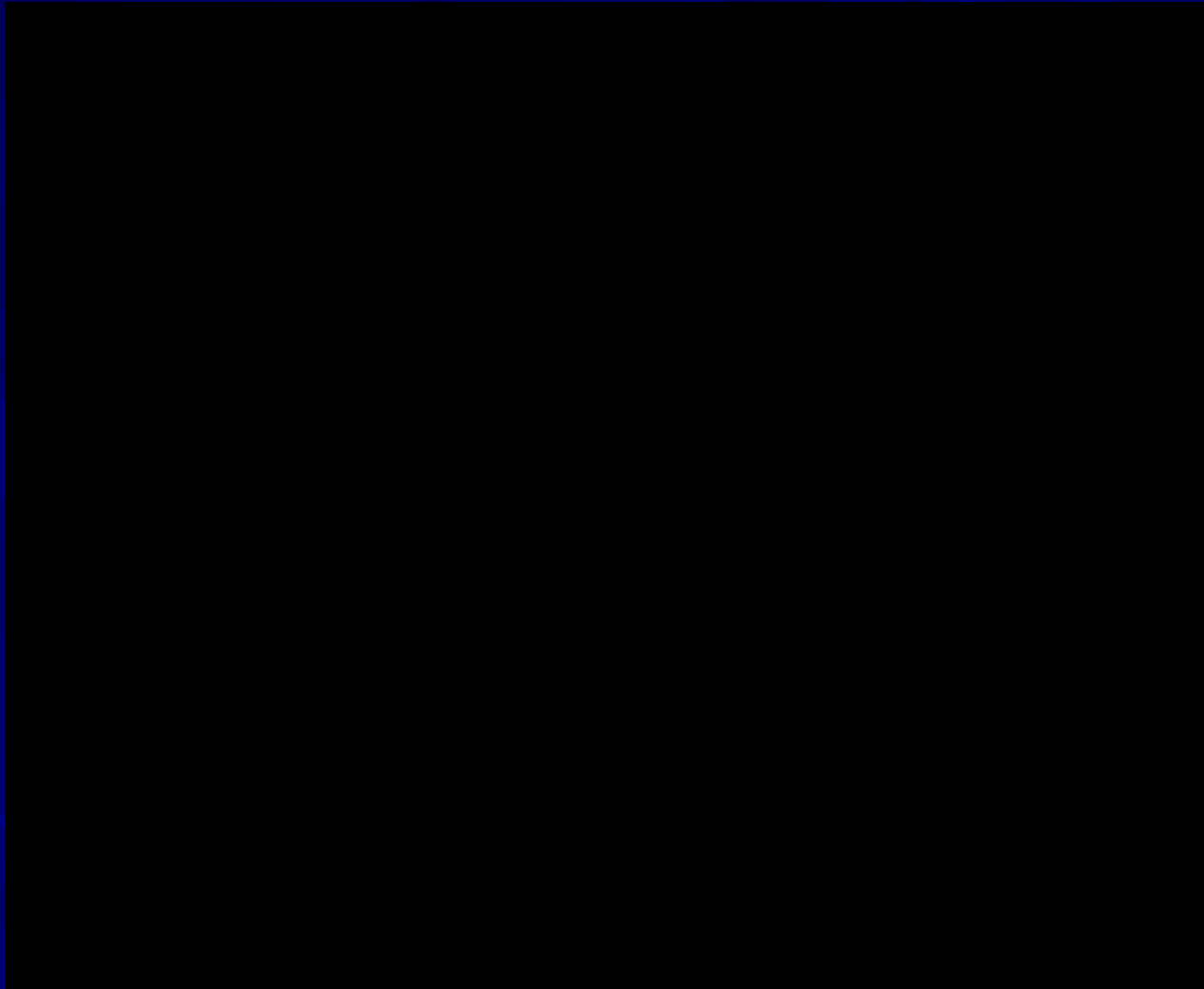


## Trauma / Wound Compression Dressing

The Emergency Bandage is the first major innovation  
of its kind in over 50 years!

- ◆ NSN # 6510-01-460-0849 - FCP-01 - 4"
- ◆ NSN # 6510-01-492-2275 - FCP-02 - 6"
- ◆ NSN # 6510-01-515-7528 - FCP-05 - 6"+mobile pad

# Hemorrhage Control



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# Hemorrhage Control

- Life-threatening arterial bleeding (amputation) may require early use of a tourniquet.
- If under enemy fire or in a dangerous position rapidly apply a tourniquet and move casualty to cover.

# Tourniquets

- Several new tourniquets have been selected as primary means to control hemorrhage in combat.



# Combat Application Tourniquet

- The C-A-T was selected as the primary tourniquet for every soldier.





# C-A-T Step 1



**Place the wounded extremity through the loop of the Self-adhering Band**



# C-A-T Step 2



**Place tourniquet  
above the injury  
site**

# C-A-T Step 3

**Pull the free-running end of the Self-adhering Band tight and securely fasten it back on itself.**





# C-A-T Step 4

**Adhere Self-adhering Band completely around the limb until the clip is reached.**





# C-A-T Step 5

**Twist the  
Windlass Rod  
until the  
bleeding has  
stopped.**





# C-A-T Step 6

**Lock the Rod in place with the Windlass Clip**



# C-A-T Step 7



**For small extremities, continue to adhere the Self-adhering Band around the extremity and over the Windlass Rod.**



# C-A-T Step 8

**Grasp the Windlass Strap, pull it tight, and adhere it to the velcro on the Windlass Clip.**



# C-A-T Tourniquet



**The C-A-T Tourniquet is now ready for transport.**



# C-A-T Tourniquet

## NOTE:

The friction adaptor buckle is not necessary for proper C-A-T application to an arm. It **MUST** be used with two hands when applying to a leg.



# C-A-T: Lower Extremity

**To use, wrap the Self-adhering Band through the friction adaptor buckle.**





# C-A-T: Lower Extremity

**This prevents the Self-adhering Band from loosening during transport.**



# C-A-T Tourniquet

**C-A-Tourniquet**  
Arm Application

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# C-A-T: Lower Extremity

C-A-Touinquel  
leg application

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# SOFTT



# SOFTT Application

- Similar to the CAT:
  - Slide loop over extremity
  - Pull strap tight
  - Twist windlass until bleeding stops
  - Latch the windlass with one of the tri-rings
  - Tighten the safety screw



# SOFTT Application



One-handed application



Two-handed application

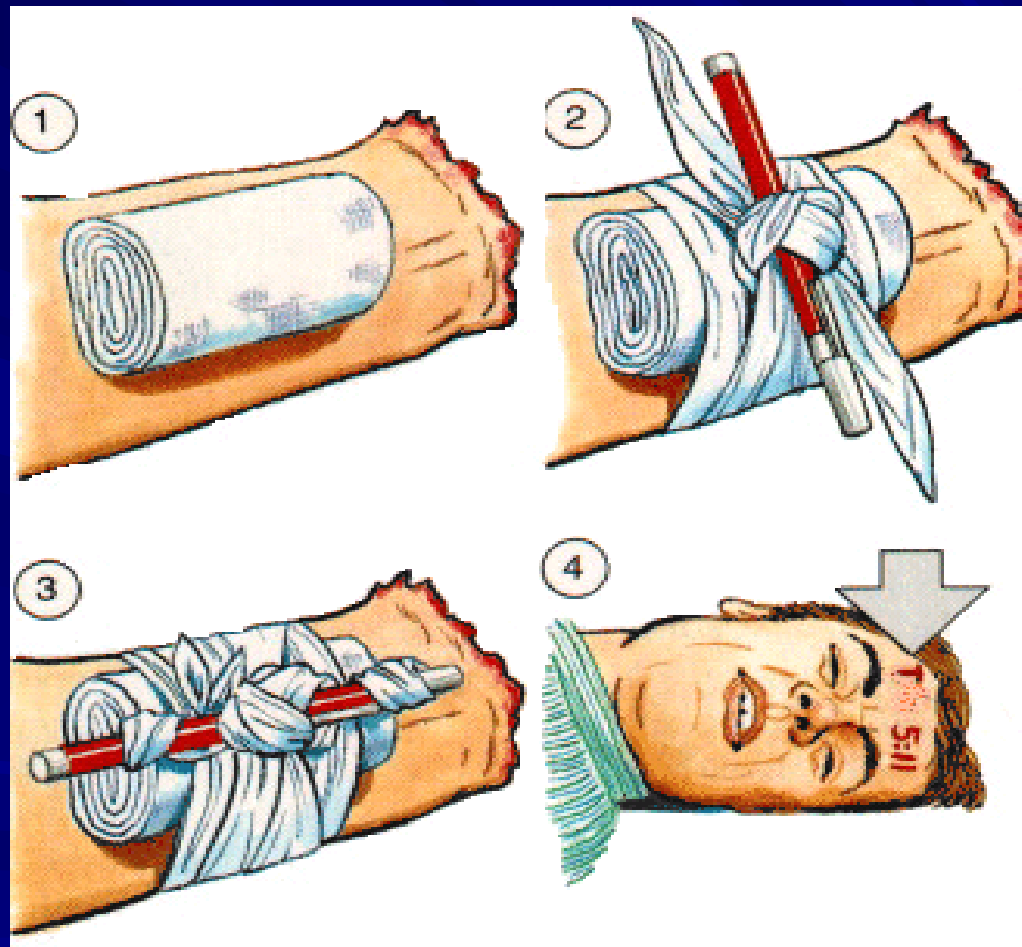


# Improvised Tourniquet

- Place cravat between heart and wound.
- Tie a half-knot on upper surface.
- Place a short stick on half-knot.
- Tie a square knot on top of stick.
- Twist stick (windlass) to tighten.
- UNTIL BLEEDING STOPS.
- Secure windlass to prevent unwinding.



# Improvised Tourniquet





# Tourniquet Principles

- Never cover a tourniquet.
- Mark a “T” on the casualty's forehead or somewhere obvious (sharpie pen).
- In combat when the tactical situation allows, loosening a tourniquet is appropriate.

# Tourniquet Removal

- Once the tactical situation allows, tourniquets should be loosened and other methods to stop bleeding applied.
  - Direct pressure - pressure dressing
  - HemCon Chitosan Bandage
  - QuikClot powder

# Tourniquet Removal

- When loosening a tourniquet, do not remove it from the limb.
- If the tourniquet has been in place for > 6 hours, do not remove.
- If fluid resuscitation is required, it should be accomplished before the tourniquet is removed.
- Tourniquets are very painful, provide pain medications as needed.

# Tourniquet Removal

- If tourniquet has been in place for only 1-2 hours, loosening and using other methods to control hemorrhage can salvage limbs.
- Remember: if unable to control hemorrhage by other means, re-tighten the tourniquet.
- It is better to sacrifice the limb than to lose a life to hemorrhage.

# Amputation

- Apply a pressure dressing to cover the end of the stump.
- Kerlix and 6" Ace wrap for effective pressure dressing.
- Rinse amputated part free of debris.
- Wrap loosely in saline-moistened sterile gauze.



# Preservation of Amputation Parts

- Seal amputated part in a plastic bag or cravat.
- Place in a cool container; do not allow to freeze.
- Never place an amputated part in water.
- Never place amputated part directly on ice.
- Never use dry ice to cool an amputated part.

# Hemostatic Agents

- HemCon® Chitosan Bandage.
- QuikClot® Hemostatic Powder.

# Chitosan Hemostatic Dressing



- Hold the foil over-pouch so that instructions can be read. Identify unsealed edges at the top of the over-pouch.

# Chitosan Hemostatic Dressing



- Peel open over-pouch by pulling the unsealed edges apart.

# Chitosan Hemostatic Dressing



- Trap dressing between bottom foil and non-absorbable green/black polyester backing with your hand and thumb.



# Chitosan Hemostatic Dressing



- Hold dressing by the non-absorbable polyester backing and discard the foil over-pouch. Hands must be dry to prevent dressing from sticking to them.

# Chitosan Hemostatic Dressing



# Chitosan Hemostatic Dressing

- Place the light colored sponge portion of the dressing directly to the wound area with the most severe bleeding. Apply pressure for 2 minutes or until the dressing adheres and bleeding stops. Once applied and in contact with the blood and other fluids, the dressing cannot be repositioned.
- A new dressing should be applied to other exposed bleeding sites; each new dressing must be in contact with tissue where bleeding is heaviest. Care must be taken to avoid contact with the casualty's eyes.

# Chitosan Hemostatic Dressing

- If dressing is not effective in stopping bleeding after 4 minutes, remove the original and apply a new dressing. Additional dressings cannot be applied over ineffective dressings.
- Apply a battle dressing/bandage to secure a hemostatic dressing in place.
- Hemostatic dressings should only be removed by responsible persons after evacuation to the next level of care.

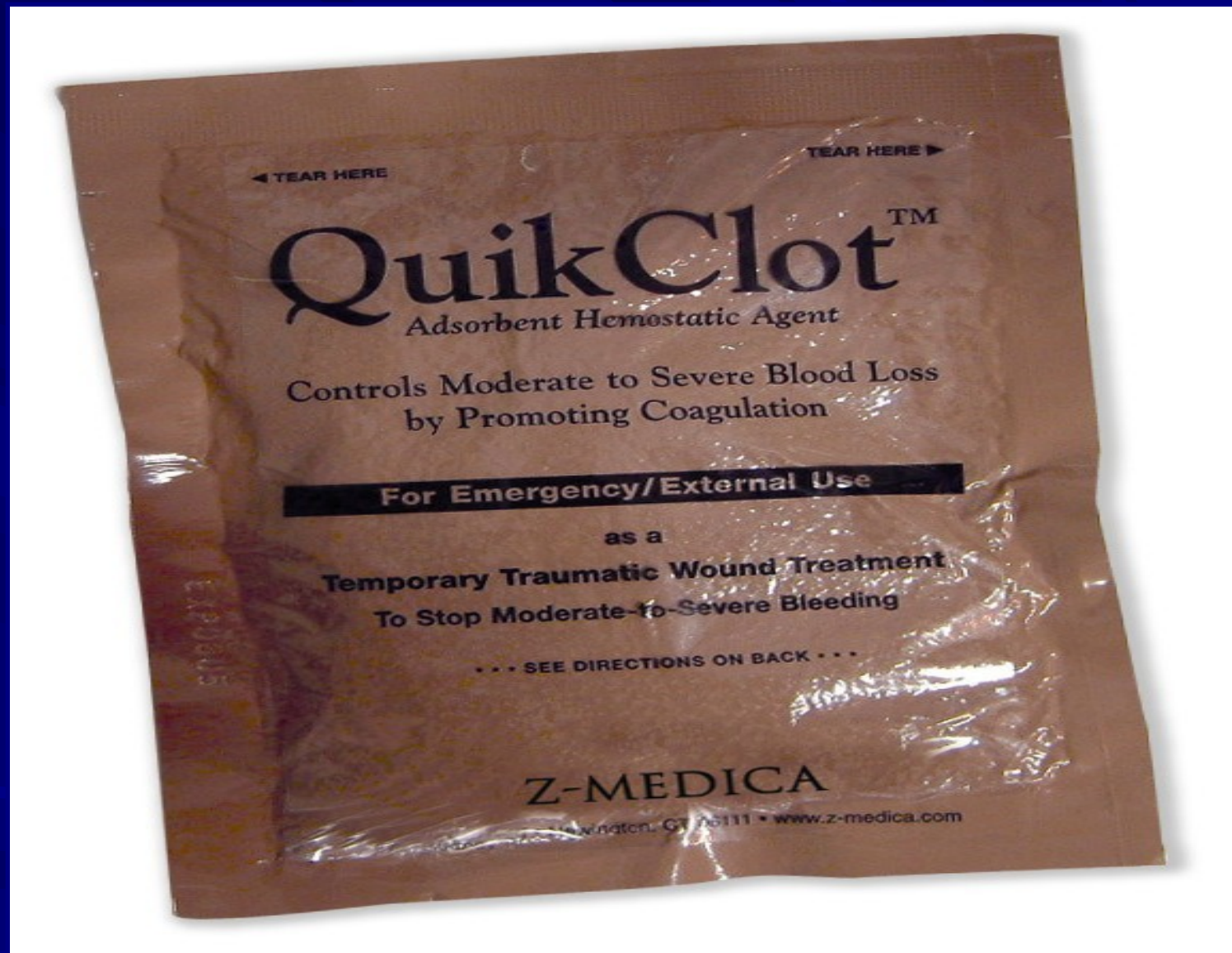


# Chitosan HCD

## Porcine Abdominal Aorta Punch

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# QuikClot

- Warning: Avoid contact with wet skin; product reacts with small amounts of water and can cause burning.
- Stop burning by brushing away granules and flooding area with large volume of water.
- If ingested, immediately drink two or more glasses of water.

# QuikClot

- Directions:

- 1-Apply direct firm pressure to wound using sterile dressing or best available substitute
- 2-If bleeding is stopped or nearly stopped after approximately 1 minute of pressure, wrap and tie bandage to maintain pressure on wound
- 3-If moderate to severe bleeding continues, hold pack away from face and tear open at tabs



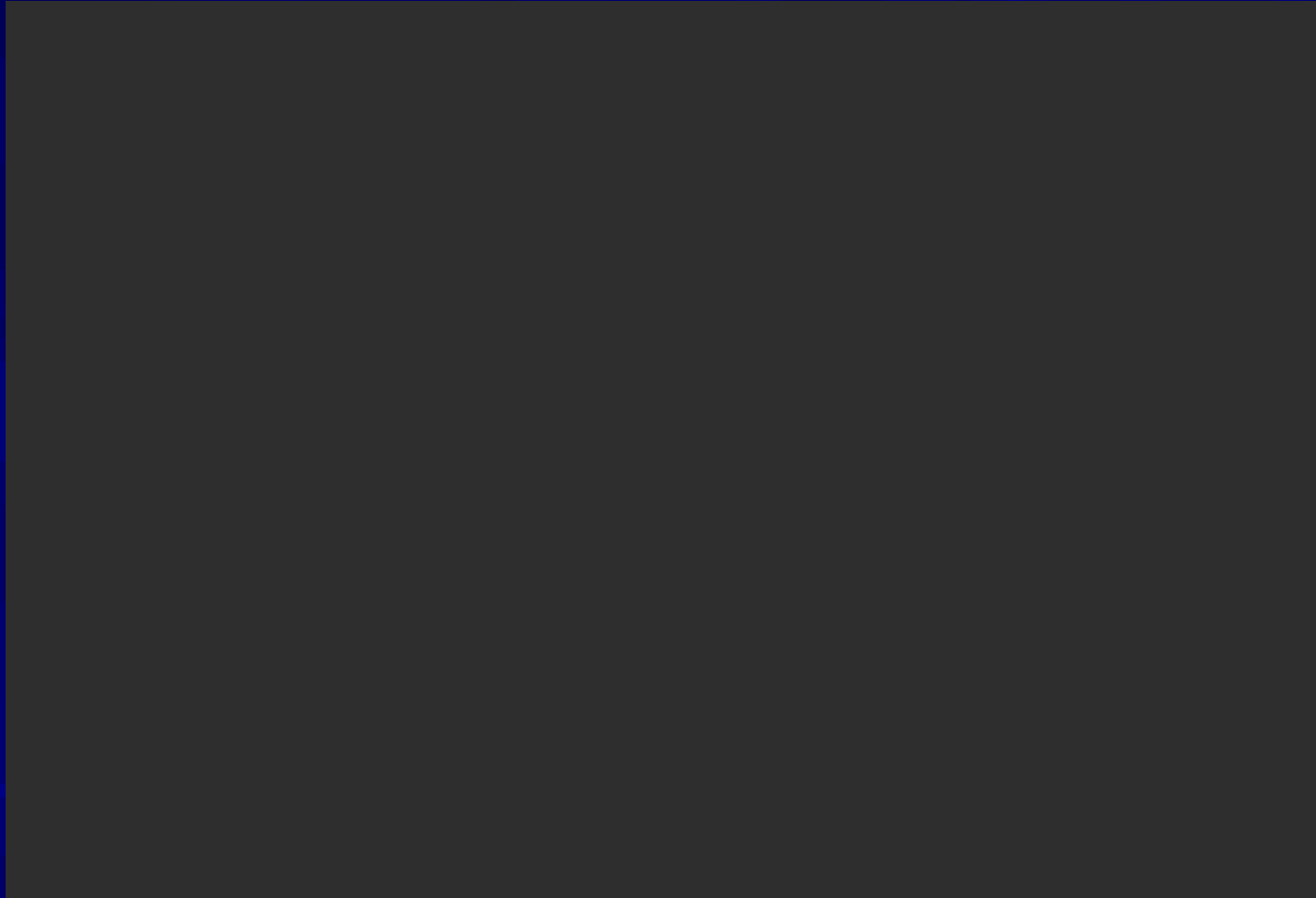
# QuikClot

- 4-Use wiping motion to remove gauze and excess blood – immediately start a slow pouring of one QuikClot packet directly onto the wound. Stop pouring as soon as dry granules cover the wound area
- 5-Use only enough QuikClot to stop bleeding. If bleeding continues open a second packet of QuikClot and continue to use as directed

# QuikClot

6-Reapply firm pressure to QuikClot covered wound using sterile gauze. Wrap and tie bandage to maintain pressure

# QuikClot



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# Treatment Goals

- Hemorrhage control continues to be the priority in battlefield care.
- Hemorrhage is the leading cause of preventable death on the battlefield.
- Our focus must be on stopping soldiers from bleeding to death on the battlefield.



# Questions?

